Original Article

A Qualitative Exploration of Acceptance of a Conversational Chatbot as a Tool for Mental Health Support among University Students in Sudan

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Abstract

Background: Sudan's political and economic challenges have increased mental health issues among university students, but access to mental healthcare is limited. Digital health interventions, such as chatbots, could provide a potential solution to inadequate care. This study aimed to evaluate the level of acceptance of a mental health chatbot prototype among university students in Khartoum, Sudan.

Materials and Methods: This qualitative study investigated the perspectives of university students regarding a mental health chatbot prototype designed specifically for this research and deployed on Telegram. Twenty participants aged 18+, owning smartphones, and not receiving mental health treatment tested the prototype. Data was collected through individual, face-to-face, in-depth, semi-structured interviews. The data was analyzed using both deductive and inductive content analysis methods.

Results: Most of the participants acknowledged the importance of mental health but felt that it was an overlooked issue in Sudan. Participants considered the chatbot to be a unique and innovative concept, offering valuable features. They viewed the chatbot as a user-friendly and accessible tool, with advantages such as convenience, anonymity, and accessibility, and potential cost and time savings. However, most participants agreed that the chatbot has many limitations and should not be seen as a substitute for seeing a doctor or therapist.

Conclusion: The mental health chatbot was viewed positively by participants in the study. Chatbots can be promising tools for providing accessible and confidential mental health support for university students in countries like Sudan. Long-term studies are required to assess chatbot's mental health benefits and risks.

Keywords: mental health, chatbots, university students, Sudan, young adults

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Introduction

University students in Sudan face significant mental health challenges due to political and economic instability. [1, 2] Economic stress has increased the risk of substance abuse as students seek relief. [3] However, access to mental healthcare in Sudan is inadequate despite the high prevalence of mental health issues. Mental health hospitals and facilities are only available to those living in large cities in a few states. [4] This situation is exacerbated by various perceived barriers to seeking care, including stigma, a lack of knowledge or trust in care providers, and a willingness to handle problems on one's own. [2]

The use of digital health interventions, particularly chatbots, presents a promising solution to address the lack of access to mental health care. Chatbots are computer programs that utilize natural language processing to engage in conversations with individuals through text or speech. [5] Despite the need for further high-quality research, initial studies on mental health chatbots have demonstrated positive outcomes, including favorable acceptance, satisfaction, feasibility, and low risk of harm. [6, 7] Research suggests that chatbots have the potential to

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with conditions such as anxiety, distress, and depression in terms of diagnosis, therapy, and adherence. [8, 9] However, the existing body of research has some limitations, including small sample sizes and short durations, which weaken the generalizability of the findings. [10]

Young people and adolescents across the globe are enthusiastic users of the internet and often seek technological solutions for mental health support and guidance. [11, 12] Among these solutions, mental health chatbots have emerged as a valuable resource, offering immediate, anonymous, and nonjudgmental care, thereby mitigating the need for extensive resources and reducing the fear of stigma, making them especially appealing to young adults. [13] In countries where access to traditional mental health services is inadequate, the availability of effective and acceptable care through chatbots becomes particularly vital for young individuals.

The existing research on digital mental health interventions in low and middle-income countries (LMICs) suggests moderate effectiveness. [14, 15] In line with this emerging literature, our study seeks to contribute by exploring the acceptability of a mental health chatbot prototype among university students in Sudan. The findings have the potential to highlight the significance of digital mental health solutions in resource-limited settings like Sudan, where traditional mental health services may be insufficient. Ultimately, we hope that the outcomes of our research will stimulate further interest and support among users and policymakers for the integration of such innovative interventions. The main objectives of this present study was what is the level of acceptance of the mental health chatbot prototype among university students in Sudan in terms of its usefulness, usability, and trustworthiness? and what are the perceived benefits, risks, and barriers to using the chatbot?

Materials and Methods

Study Setting

This qualitative study aimed to explore the acceptance of a telegram-based mental health chatbot prototype called Nori chatbot among university students in Khartoum, Sudan. The data collection period spanned from January 29 to February 14, 2023, and the study obtained ethical approval from the International University of Africa Research Ethics Committee. All participants provided informed consent.

Chatbot Design and Features

The Nori chatbot prototype was specifically designed for the study and deployed on Telegram. Telegram was chosen as the platform for the study because it provides a cost-effective solution for hosting chatbots with its free usage. The chatbot used everyday language that was understandable to the target audience. It includes:

Introductory Section:

The Nori chatbot commenced conversations with an informative introductory section, outlining its purpose and user guidelines. The section emphasized the assurance of anonymity, and confidentiality, and the recommendation to seek professional treatment in cases of severe symptoms. The chatbot aimed to create a safe and trustworthy environment for users to engage with their mental health.

Anxiety Assessment: A key feature of the Nori chatbot was its quiz-based anxiety assessment tool. Users were prompted to respond to a series of questions adapted from the 7-item Generalized Anxiety Disorder (GAD-7) Questionnaire, tailored to Arabic-speaking users. [16] The assessment provided users with a grade, offering insights into their anxiety level and fostering self-awareness.

Self-Help Therapeutic Scenarios: The Nori chatbot integrated self-help therapeutic scenarios derived from the Arabic version of the WHO's youth mental health and stress management guide, "Doing What Matters in Times of Stress: An Illustrated Guide," with permission obtained from WHO. [17] These scenarios focused on mindfulness, grounding, and unhooking from unkind thought exercises, were presented as concise and actionable messages. Furthermore, interactive spaces allowed users to express their thoughts and feelings, encouraging active engagement in their mental health journey.

Participants

A convenient sampling method was used to recruit twenty university students from Khartoum, who were 18 years or older and owned a smartphone. Participants with a diagnosed mental health condition who are currently undergoing treatment from specialized professionals were excluded from the study to avoid any potential interference with their ongoing treatment regimen. The sample included both male and female participants from higher and lower academic levels, and data collection continued until data saturation was achieved.

Data Collection and Sampling Process

Data collection involved conducting individual, face-to-face, in-depth, semi-structured interviews with university students to gather their opinions on the Nori chatbot prototype. Two data collectors were recruited after the proposal's development and trained to conduct the interviews. The interviews were conducted in Arabic, audio-recorded, and guided by a topic questionnaire **(Annex-1).** Before the interviews, participants provided written informed consent and were familiarized with the Nori chatbot.

The interviews began with an introductory question, exploring the participants' concerns about mental health and their prior experiences with digital mental health resources. Subsequently, participants were asked to share their opinions on the Nori chatbot prototype, focusing on its acceptance, potential for future use, and suggestions for improvement. The interview duration ranged from 20 to 30 minutes. Some interviews were conducted in university settings, while others took place at participants' homes.

Data Analysis

The recorded interviews were transcribed and analyzed by two independent data analysts not involved in the data collection process. Qualitative content analysis was used to identify themes and subthemes initially using a deductive approach based on the questionnaire topic guide. [18, 19] These predefined themes encompassed the mental health profile, prior use of digital mental health resources, acceptance of the Nori chatbot in terms of usefulness, content, trustworthiness, intention to use, concerns, comparison with traditional methods, and suggestions for improvement. [18]

Subsequently, an inductive approach was applied to allow new themes and categories to emerge directly from the interview data during the analysis process. Each data analyst independently added codes and subthemes within the predetermined deductive themes, exploring novel insights and themes arising directly from the participants' responses. Any discrepancies were discussed and resolved during consensus meetings between the data analysts. To ensure validation and rigor, a peer debriefing process involved seeking feedback from a third researcher to verify the study's interpretations and findings. The two data analysts, along with the third researcher, are members of the research team and actively contributed to the proposal development. In presenting the findings, the researcher aimed to present the participants' voices as accurately and faithfully as possible. Any interpretative decisions made during the data analysis were transparently identified and substantiated by specific quotes from the data.

Results

Socio-Demographic Characteristics and Views on Mental Health

The study comprised twenty participants, with a gender distribution of nine males and eleven females. The mean age of the participants was 21.44 years, with an age range of 18–24 years. The interview commenced with general questions aimed at gaining insights into the participants' mental health needs and their existing knowledge concerning digital mental health. Most participants acknowledged the importance of mental health but felt that it was an overlooked issue in Sudan. Stress and anxiety were identified as the most common mental health concerns among university students, with the current political and economic situation in Sudan being a contributing factor. While some participants regarded stress and anxiety as normal, others perceived it as a serious problem for young adults in an unstable country as shown in **Table – 1.**

Acceptance of the Mental Health Chatbot Prototype

Following the initial general questions, a set of specific inquiries related to the chatbot prototype was posed to the participants. The analysis revealed two main themes related to the acceptance of Nori Chatbot among university students in Sudan: (1) perceived benefits, and (2) concerns and challenges. Within these themes, eight subthemes were identified.

Perceived Benefits

Functionality: The study participants considered digital health and the Nori chatbot to be unique and innovative concepts in Sudan. They recognized that Nori chatbot offers several valuable features, including mental health self-assessment, enabling individuals to gain insight into their current mental health status and identify any potential stress or anxiety issues they may be facing. Furthermore, participants noted that the chatbot helps individuals evaluate their mental health and determine if they need to seek consultation with a psychiatrist.

Accessibility: Participants in the study viewed the Nori chatbot as a user-friendly and accessible tool, suitable for anyone regardless of their level of electronic expertise. The research participants identified several advantages of using the Nori chatbot over traditional means of healthcare. They cited the ease of use, availability 24/7, and lack of financial cost as major benefits. Study participants appreciated the convenience of being able to use the Nori chatbot from the comfort of their own homes using a mobile phone, without having to travel to a hospital or other distant location. Participants believed that Nori chatbot could help individuals save on transportation costs and eliminate

Table 1: Perception Towards Mental Health Issues

Perception	Females	Males	Quote
Mental health illnesses are a normal part of life	7 (63.6%)	4 (44.4%)	"I have no concerns about mental health, these are normal problems that happen to anyone and it is normal." **(Participant 1)**
Mental illnesses are serious issues	4 (6.4%)	5 (55.6%)	"Fear of the unknown, the deteriorating situation of the country, conflicts between parties, psychological pressures, ambitions that diminish with each passing day, and a moral crisis affecting values at all levels - all these problems lead us to think and strain our mind in search of solutions. As a result, we find ourselves always worried and tense." **(Participant 18)**
Total	11 (100.0%)	9 (100%)	

the need for costly clinic visits for those who may not have the means to see a doctor.

Anonymity: Participants saw Nori chatbot as a potential solution for those seeking remote treatment options, as it provides individuals with the support they need without the fear of being judged or discriminated against. Participants valued the chatbot's confidentiality and anonymity features which provide users with the freedom to hide their true identity, further increasing their trust in the chatbot. They valued the potential of Nori chatbot to help overcome the stigma of mental illness that some Sudanese individuals may feel.

Safety: Most of the participants thought there was no need to worry about the safety of this chatbot. The participants found the content provided by the chatbot to be written by competent authorities, such as doctors and university experts, which contributed to its credibility. They also appreciated the privacy of the dialogue between the chatbot and the user, as they believed it made it impossible for anyone to interfere or manipulate the conversation.

This theme includes four sub-themes as illustrated in **Table – 2.**

Table – 2 Perceived Benefits of the Mental Health Chatbot

Subtheme	Description	Number of Participants	Quote
Functionality	The self-assessment feature	11 (55%)	"Its benefits are that it gives an initial assessment of mental health, and through it, a person can know himself whether he is in a good state of his mental health or that he needs to see a psychiatrist". **(Participant 3)**
Accessibility	Easy access	20 (100.0%)	"The application is easy to use…reduces the cost of transportation and saves you from going to the hospital. It is possible while you are sitting at home to know your mental health, it relieves you of the burden of meeting the doctor and transportation." **(Participant 12)**
	Cost and time saving	13 (65%)	"An excellent application, because we at the university will never have the time because of many problems...we will not have time or even money to go to centers or meet doctors... something like this will be very useful for us...but for the whole community and not just us as young people." **(Participant 19)**
Anonymity	Stigma	4 (20%)	"A person may be ashamed and not go to a clinic or something like that, especially for us Sudanese, when a person goes to a psychiatric clinic, they say that he is insane, while he is not insane. Some people are ashamed, some people do not have a way to go to a doctor, it is convenient in these cases and very useful." **(Participant 13)**
	Reduction Privacy	3 (15%)	"The dialogue between the bot and the user is confidential, meaning it is not visible to anyone else. Additionally, users have the option not to enter their real identity or name." **(Participant 6)**
Safety	Professional content	4 (20%)	"I trust it because it is clear that it is written by a competent authority and because it is very well written." **(Participant 14)**

Concerns and challenges

Insufficient content: The chatbot's content, according to the study's participants, is a good starting point for someone without a major psychological problem, however, it may not provide sufficient information to adequately answer questions about what to expect next. The available questions are also perceived to be limited in scope and detail, and the content is relatively simplistic, lacking coverage of all mental illnesses and failing to specify the factors that contribute to their development.

Participants noted that the chatbot lacked the type of treatment and where the personal contacts to obtain it. To enhance the effectiveness of the chatbot, the study participants recommended the inclusion of contact information for psychotherapists and mental health professionals, enabling individuals to access additional support beyond the chatbot. They also suggested that online communication with these professionals could be facilitated through the chatbot.

Communication Limitations: One drawback of the Nori chatbot identified by the participants, compared to traditional methods of seeking healthcare, is its limited ability to explain and discuss complex issues with patients. A doctor or therapist is claimed to provide more precise and personalized advice, and can also observe and assess the patient in person.

Table – 3 Showing all the concerns and challenges of sub themes among participants

Sub Themes	Descriptions	Number of Participants	Quotes
Insufficient content	Limited scope and detail	12 (60%)	"It's a good thing, but not enough for someone who has a problem. Because now I don't have a problem so I can deal with it. But if I have a problem, I do not think that these questions will be enough, and there are many things that he did not address." **(Participant 9)**
	Inadequate explanation of next steps	3 (15%)	"We need details of where people can be treated, especially that Sudanese people have a problem with going to a psychiatrist. If they told them that the treatment would be over the phone, it would be easier." **(Participant 17)**
Communication limitations	Limited ability to explain and discuss complex issues	2 (10%)	"The doctor asks more accurate questions and he sees the person in front of him while he is saying the words." **(Participant 10)**
	It does not substitute traditional care	7 (35%)	"It is easy for a person to use the application, but if he finds that he is very sick psychologically, he should go to mental health clinics and meet a specialist than use the application." **(Participant 6)**
Network and technology issues	Network and internet connection limitations	20 (100.0%)	"People who do not have internet or have weak internet, individuals without smartphones, those unfamiliar with Telegram or chatbots, and those who do not know how to access social media and Telegram; all of these factors can hinder its spread." **(Participant 6)**
	Risk of unauthorized access	1(5%)	"I do not trust it because it can be hacked at any time unless it is completely secured." **(Participant 17)**
Accuracy concerns	Diagnostic error	2 (10%)	"Trust exists, but sometimes there is no trust, and there are fears that, in the end, it is just an application... that problems may occur within the application... that the person writes answers, and the application gives him the wrong answer... that he does not suffer from that problem in the first place... or that it might diagnose a problem for a person, leading them into another spiral of suffering from psychological problems they do not have in the first place." **(Participant 5)**

Most participants agreed that the chatbot should not be seen as a substitute for seeing a doctor or therapist, but rather as a tool to help individuals assess their condition and determine if they need professional medical attention.

Network and technology issues: According to the research participants, several obstacles may affect the adoption of the Nori chatbot. These include the unavailability and cost of the Internet, weak and intermittent network connectivity in some areas, and lack of possession of a smartphone or familiarity with technology. Another problem is the fact that the chatbot is available only on Telegram, which is not widely used in Sudan.

Additionally, participants raised concerns about the security of the app and the possibility of unauthorized access or hacking, emphasizing the importance of ensuring that the app is well-secured. Accuracy concerns: Some of the participants have concerns about the potential for inaccuracies and the risk of receiving an incorrect diagnosis because it is an application or machine. Participants expressed concern about the possibility of receiving a misdiagnosis through the chatbot, which could lead to unnecessary fear and anxiety, especially if the user is in good health. This theme includes four subthemes as described in **Table – 3.**

Discussion

University students in countries with complex socio-political situations represent a vulnerable subgroup of young adults who are susceptible to mental health issues. [20] This study aimed to investigate the level of acceptance of a mental health chatbot prototype among university students in Sudan and the perceived benefits, risks, and barriers to using the chatbot.

The chatbot prototype was viewed by this study's participants as a potentially useful and convenient resource to receive support and guidance for mental health concerns. There is favorable evidence in terms of satisfaction, acceptance, and practicability of chatbots for mental health. [13, 18, 21] Young adults hold a positive perception of chatbots and have reported high levels of satisfaction and engagement with this technology, rating them as highly helpful, usable, and acceptable. [21] According to the study's participants, their trust in the chatbot was enhanced by features such as confidentiality, anonymity, and a connection to a competent professional authority. Nonetheless, participants voiced concerns about potential inaccuracies, incorrect diagnoses, and data breaches. While chatbots pose a low risk of harm, there are potential risks of misinterpretation of user responses, technical errors leading to harmful advice, repetitive interactions making it feel less human-like, and overreliance on chatbots. [6, 7, 13, 21] Legal frameworks that protect chatbot users, particularly in terms of data privacy, are crucial.

Participants identified several advantages of using the chatbot over traditional healthcare, including increased accessibility, and anonymity, making it helpful in saving time and money and overcoming the stigma of mental illness. University students in Sudan face significant stigma when seeking treatment for mental health issues, which can prevent them from seeking the care they need. [2]

Participants in this study found the mental health self-assessment feature useful for identifying potential issues and determining if they need to seek professional help. In cases where an individual experiences symptom, the chatbot was expected by the participants to offer a preliminary diagnosis and guidance on what to do next. This result is important because global mental health research indicates the effectiveness of chatbots in preventing and reducing symptoms of mental health conditions, including psychological distress, anxiety, and depression. [6, 7, 9, 22, 23] According to therapists, chatbots have the potential to enhance patient engagement in therapy goals and assist in completing assigned tasks, leading to faster progress. [24] Chatbots have been employed across multiple settings to help in diagnosing and screening patients, thereby identifying at-risk individuals and reducing the workload on medical workers. [13]

Like their counterparts in other countries, most participants perceived chatbots as complementary to seeing a doctor or therapist. This perception stems from the recognition that chatbots have limitations in their ability to understand responses and emotions compared to real therapists. It is not recommended to rely solely on chatbots as a substitute for mental health professionals due to their limited ability to explain and discuss complex issues with patients. [9]

The study has several limitations that should be considered. The sample size is small and may not be representative of the entire population of university students in Sudan. The study was conducted using a telegram-based chatbot, which may not be representative of other chatbot platforms or technologies. Another limitation is the simplistic nature of the chatbot prototype's features and content.

Conclusions and future outlook

The study findings shed light on how the mental health chatbot prototype was perceived by university students in Sudan, who viewed it as a promising and convenient resource for seeking support and guidance on mental health matters. The participants acknowledged various advantages, particularly in terms of accessibility and functionality, while also expressing some concerns. The potential of digital mental health solutions, particularly chatbots, holds great promise in tackling mental health challenges in resource-limited and politically unstable countries like Sudan. However, to fully realize their benefits, in-depth and extensive research is imperative to ascertain the feasibility, effectiveness, and overall acceptance of chatbots, both among the general population and specifically among young individuals suffering from mental illnesses.

Educational institutions have a unique opportunity to take the lead by developing school and college-based chatbots, initially aimed at promoting mental health and well-being. Young people tend to place greater trust in digital health platforms affiliated with professional organizations, especially if they are associated with their educational institution. [11] Implementing such chatbots within colleges and schools has the potential to foster higher acceptance and engagement among the target population, enhancing the overall impact of these interventions. Authorities must prioritize the development of legal frameworks to regulate this technology and safeguard chatbot users, with particular emphasis on data privacy concerns.

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Annex – 1 Distribution of Interview topic guide

Introduction	Topics	Procedure
	Welcome and purpose	Briefly introduce the purpose of the study and its significance.
	Informed Consent	Explain the informed consent process and ensure the participant understands and agrees to it.
	Socio-demographic Information	Ask for the participant's name, age, gender, and academic level of education.
	Mental Health Issues	a. Inquire about the participant's concerns regarding mental health. b. Ask if they have any prior knowledge or experience with digital mental health resources and have them explain.
Acceptance	**Explore their opinion on Nori chatbot and its features**	• Ask the participant to explain any potential benefits of Nori chatbot. • Inquire about their opinion on the content and response of Nori chatbot. • Ask about the ease of use and whether they trust the chatbot. If not, explore their fears. • Inquire about any potential risks from using the chatbot and have them explain. • Ask if they would consider using Nori chatbot in the future and how it compares to traditional care.
	Challenges and Improvements	• Explore the participant's thoughts on potential challenges in expanding the use of the chatbot. • Inquire about any improvements they suggest for the chatbot.
Conclusion		Thank the participant for their time and input.